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VOLATILE FLAVORING SUBSTANCES CAPTURED
BY NEW PROCESS AT APPLE-PRODUCTS PLANTS

Apple juice, as well as other apple products, with the taste and tang of ripe apples is one result of long-term research by the U. S. Department of Agriculture to develop new commercially profitable outlets for agricultural products now partially or entirely wasted on farms and in industrial plants. Chemical engineers of the Eastern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry have devised a method for recovering the "essence" from apple juice before it is concentrated. Thus flavoring compounds that previously were a complete loss now may be captured at apple concentrate and vinegar plants and put to commercial use.

As chemists long have known, apples owe their distinctive flavor and aroma to a complicated combination of alcohols, esters, acids, and aldehydes manufactured within the fruit as it grows and matures. The chemists also know the approximate proportions of these substances in apple juice, even though they constitute only about 60 parts per million of the juice and are extremely volatile. Because of their low evaporation temperatures, these substances are lost from fresh apple juice while it is being pasteurized or made into concentrates.

Department chemists found that adding the essence to a mixture of water and concentrated apple juice, in the proportion of 1 1/4 fluid ounces to 1 quart of concentrate and 5 quarts of water, gives about 6 quarts of juice with true apple flavor, particularly when tart apples, like McIntosh and Stamen Winesap, are used. The essence also may be added to apple sirups, jellies, jams, and candies that have a very bland taste unless fortified with this extra flavor. Several firms now use the process to make apple essence for incorporation into their food products. More firms, it is expected, will follow suit as soon as difficulties arising from the alcohol content of the essence have been overcome.

When the alcohol content of the essence reaches 0.5 percent, the product must be classed as a "potable distillate", and as such it becomes subject to tax and inspection under Federal laws governing the distillation and sale of alcoholic beverages. The research staff of the Eastern Regional Research Laboratory is working on the problem of reducing the alcohol content of apple essences. One solution that looks hopeful is the reduction of the degree of evaporation of the juice from 10 to 3 percent of its volume. At 3-percent vaporization, the alcohol content of the essence is approximately one-third that obtained when 10 percent of the juice is evaporated, yet only an extremely slight reduction in the strength of the essence results.

The following pictures show some of the research at the Eastern Regional Research Laboratory that resulted in the new process for recovering apple essence and incorporating it in various apple products.

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(EDITORS AND WRITERS: You may obtain 8x10 glossy prints of any of the pictures here shown free on request to Press Service, Office of Information, U. S. Department of Agriculture, Washington 25, D.C.).

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A new method for recovering volatile flavoring substances from apples was developed in the Eastern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry, U. S. Department of Agriculture, at Philadelphia, Pa. Here also juice and candy fortified with the captured essence were prepared and tested.

(1) Two laboratory workers feed apples into the washer. The washed apples will be pressed in a cider press.

(2) A small, portable unit, developed to extract the flavoring substances from apples as near the orchard as possible, operates on the same principles as large-scale extraction units set up in the laboratory and in several industrial plants.

(3) A laboratory worker holds a bottle of apple essence that was stripped from 5 gallons of fresh apple juice. This essence makes up but a small fraction of the juice.

(4) The essence has a very pleasant aroma.

(5) When put through the essence recovery unit, 1 gallon of apple juice gives 7 pints of water, 1 pint of concentrate, and 1 ounce of 150-fold essence.

(6) A laboratory chemist tabulates the results of his taste tests on samples from 5 different lots of apple essence.

(7) A laboratory chemist stirs up an experimental batch of candy to which apple essence has been added.

(8) Another laboratory chemist pours an experimental batch of candy flavored with apple essence into starch molds.

(9) A group of laboratory workers sample the new apple candy.